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Engineering Institute Seminar

Dr. Jerome P. Lynch
University of Michigan

"Intelligent Wireless Monitoring Technologies for Structural Health Monitoring"

Tuesday, June 12, 2012
3:30 - 5:00 PM
Los Alamos Research Park, TA-03, Bldg. 4200 , Suite 101,
Access Grid Conference Room

Abstract: The long-term deterioration of large-scale infrastructure systems is a critical problem that if left unchecked, could lead to catastrophic structural failures similar in magnitude to the collapse of the I-35W Bridge (Minneapolis 2007). Structural health monitoring (SHM) systems have been proposed for automated detection and quantification of structural degradation in an affordable and real-time manner. Fortunately, the past decade has witnessed the emergence of many new sensing and information technologies that have the potential to radically transform current SHM system design paradigms. This presentation provides a detailed overview of an emerging set of sensor technologies under development at the University of Michigan. The overall SHM system architecture spans multiple length scales with data collected from sensors deployed at the local and global scales of a structure. Furthermore, a cyberinfrastructure system is proposed to aggregate raw and processed data from multiple bridges at the regional scale. At the local scale, self-sensing materials are capable of directly detecting the onset of structural damage. For example, self-sensing cement-based composites and carbon nanotube coating systems are being developed for use in the construction of future bridge systems. Data from self-sensing materials, as well as from more traditional sensors, are collected using ultra low-power wireless sensors powered by a variety of power harvesting devices fabricated using microelectromechanical systems (MEMS). In the system design, data collected by wireless sensors is seamlessly streamed across the internet and ingested into a regional database system upon which finite element models can be autonomously updated and life-cycle analyses conducted. Sensor and analytical data stored in the system database can also be fed into a decision making toolbox that would assist infrastructure owners in their decision making processes. The project makes use of short- and long-span testbed bridges, including the New Carquinez Suspension Bridge in California, for full-scale validation of the monitoring system.

Biography: Dr. Jerome Lynch is an Associate Professor of Civil and Environmental Engineering at the University of Michigan; he is also holds a courtesy faculty appointment with the Department of Electrical Engineering and Computer Science. Dr. Lynch completed his graduate studies at Stanford University where he received his PhD in Civil and Environmental Engineering in 2002, MS in Civil and Environmental Engineering in 1998, and MS in Electrical Engineering in 2003. Prior to attending Stanford, Dr. Lynch received his BE in Civil and Environmental Engineering from the Cooper Union in New York City. His current research interests are in the areas of wireless structural monitoring, feedback control systems, and sustainable built environments. Dr. Lynch was recently awarded the 2009 Presidential Early Career Award for Scientists and Engineers (PECASE) by the White House.

NOTE: LANL engineers can attend these lectures to fulfill continuing education requirements for professional engineer's licenses. Be sure to mark your signature with an asterisk on the sign-in sheet.

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Contact Chuck Farrar at farrar@lanl.gov for further assistance. Seating is limited and is on a first-come basis.
Hosted by the Engineering Institute (EI)